Application of “Water Safety Plan” to drinking water quality management in Japan

Shoichi KUNIKANE*
Department of Water Supply Engineering, National Institute of Public Health (NIPH)

Introduction

“Water Safety Plan (WSP)”, a highlight in the third edition of WHO Guidelines for Drinking-water Quality [WHO, 2004], is a very important tool to achieve health-based targets. WSP requires the systematic management of drinking water quality from a source to consumer taps. In this paper, Japan’s approaches to WSP incorporation in drinking water quality management are described.

Japan approaches to WSP incorporation in drinking water quality management

Activities for the introduction and application of WSP to the drinking water quality management in Japan include a research study on WSP application in municipal water supplies and the development of guidelines on WSP application. Key steps in developing a WSP are shown in Figure 1 for reference.

Research study on WSP application in municipal water supplies

A research study, with its objective of exemplifying the way of WSP introduction to municipal water supplies in Japan and funded by a grant of MHLW, started in FY2004. Five water supplies, such as Tokyo, Yokohama, Osaka, Osaka (bulk water supply) and Kobe, are going to reformulate their drinking water quality management programs applying the concept of WSP. The study originally started on a trial basis, but it actually contributes to streamlining and upgrading their current programs of drinking water quality management. Tokyo Metropolitan Water Supply and Osaka Municipal Water Supply are going to obtain or have obtained ISO 9001 certifications regarding to their water treatment and/or distribution systems along with WSP application.

*2-3-6 Minami, Wako, Saitama 351-0197 Japan E-mail: kunikena@niph.go.jp

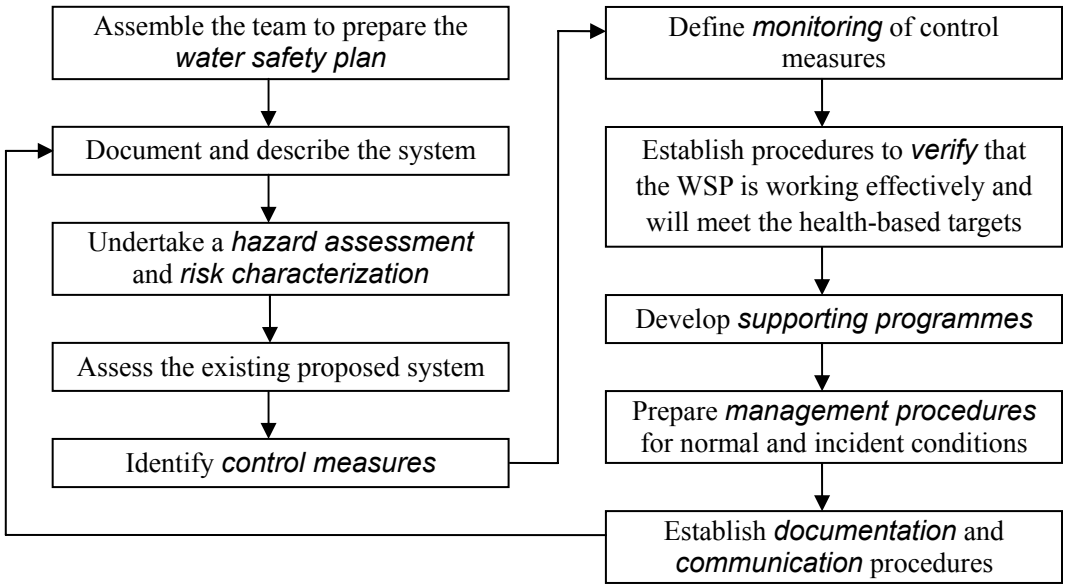


Figure 1 Overview of the key steps in developing a Water Safety Plan (WSP)

Development of guidelines on WSP application

A committee for the development of guidelines on WSP introduction was organized in Japan Water Works Association (JWWA) under the financial support of MHLW in FY2005. A few trials of WSP application to small drinking water supplies are being implemented. There exist more than eight thousand small water supplies, with a population served of 101-5,000 persons, in Japan at present. Their water quality management is rather poor compared with municipal water supplies, and its improvement is of vital importance for preventing waterborne disease outbreaks caused by drinking water contamination. Most of them lack manpower, technology and financial resources. Therefore, small water suppliers will become the main audience of the guidelines on WSP application. Their WSP should be simple, user-friendly and easy to improve. Draft guidelines will be prepared until March 2007.

WSP dissemination to developing countries through international cooperation

NIPH has been serving as the coordinator of Operation and Maintenance Network (OMN) Group since several years ago. OMN is a NGO established in 1990 under WHO for the purpose of improving the operation and maintenance of water supply and sanitation facilities especially in developing countries through the exchange of experiences, knowledge and information. The main activities of OMN include training tool development, convening workshops/seminars and information exchange through the web. Recently, OMN is contributing to the improvement of drinking water quality management through WSP dissemination to developing countries in Asia

collaborating with WHO, JICWELS (Japan International Corporation of Welfare Services) and other institutions as written below.

- JICWELS workshop on WSP and other topics, Hue, Vietnam, June 2005; Collaboration with OMN and WHO/WPRO
- JICWELS seminar on water supply management (WSP and other topics), Tokyo, January 2006; Collaboration with ONM, WHO/WPRO and NZ
- WHO-OMN workshop for PPWSA (Phnom Penh Water Supply Authority) on water supply management (WSP and other topics), Phnom Penh, Cambodia, October 2006

Conclusions

There is no doubt that WSP is essential for ensuring drinking water safety. Hazard identification seems a key component of WSP. Catchment management should be paid more attention to by drinking water suppliers in order to achieve drinking water safety. The way of WSP application may vary according to the situations of individual water supply.

Reference

World Health Organization: Guidelines for Drinking-water Quality, 3rd Edition, Vol.1: Recommendations, 2004

Application of "Water Safety Plan" to drinking water quality management in Japan

US-Japan Governmental Conference
22-24 January 2007, Okinawa

Shoichi Kunikane
Department of Water Supply Engineering
National Institute of Public Health (NIPH)

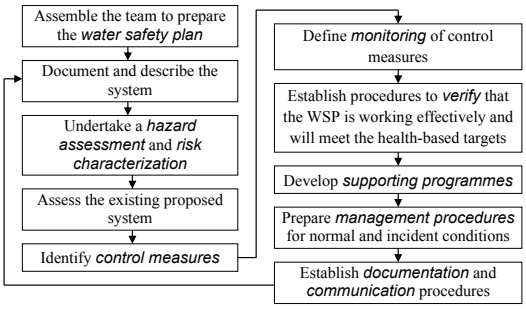
Water Safety Plan

(WHO Guidelines for Drinking-water Quality, 3rd Ed.)

- A management tool
- Uses a comprehensive risk assessment and risk management approach encompassing all steps in water supply
- From water source (catchment) to consumer

Objectives

- Minimize contamination of source water
- Remove contamination through treatment
- Prevent re-contamination during storage, distribution and handling of drinking-water



Key steps in developing a Water Safety Plan (WSP)

WSP application in the world

- "Bonn Charter" (IWA, 2004)
- Incorporation in the regulatory framework in New Zealand and United Kingdom
- Trials in Germany
- Use in international cooperation by the US
- Application in many developing countries

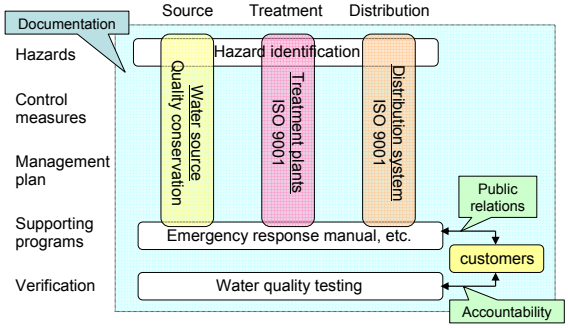
WSP: Japan's approaches

- Introduction into drinking water supplies in Japan
  - ➢A research study on WSP application in municipal water supplies
  - ➢Development of guidelines on WSP application
- Dissemination to developing countries through international cooperation

A research study on WSP application

- ➢Research period of FY2004-2006 (for three years)
- ➢Funded by a grant of MHLW
- ➢Case studies on WSP application to drinking water quality management in municipal water supplies; Tokyo, Yokohama, Osaka and Kobe
- ➢Contribution to streamlining and upgrading their current drinking water quality management programs

WSP application in Osaka City Water Supply



Development of guidelines on WSP application

- ➢Guideline development in FY2005-2007 (for three years)
- ➢Provision of a fund by MHLW
- ➢Organization of a committee for guideline development in JWWA
- ➢Small water suppliers as main audience
- ➢Guidelines being simple, user-friendly and easy to improve
- ➢Reference to New Zealand's approach

Small water supplies in Japan

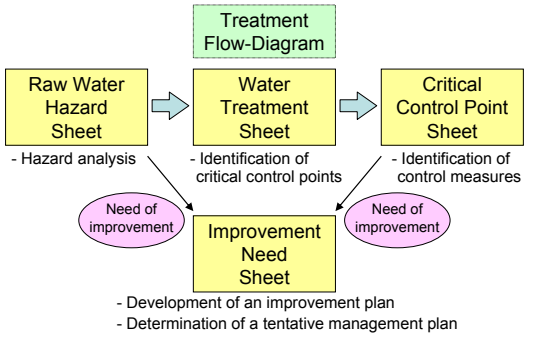
Population served	Systems	Proportion (%)
>4,000	465	5.5
3,000-4,000	344	4.1
2,000-3,000	528	6.3
1,000-2,000	1,116	13.2
500-1,000	1,435	17.0
<500	4,540	53.9
Total	8,428	100.0

Population served of less than 1,000 persons: Approx. 6,000 systems

Note: 1) Data as of FY2003.
2) The population served by a "small water supply" is nominally 101 to 5,000 according to its definition.

Importance of WSP to small water supplies

- Inadequate facility maintenance
- Necessity of limited source prioritization
- Insufficient operation manuals
- Inadequate record keeping
- Necessity of existing system improvement
- Need of operator's awareness raising



(Draft) WSP worksheets for small water supplies

(Draft) Example of a Water Treatment Sheet <Rapid sand filtration system>

From a Raw Water Hazard Sheet

From a Treatment Flow-Diagram

Process or facility	Hazard	
	E. coli	*Crypto*
Intake		
Receiving well (Prechlorination system)	○	
Polyaluminum chloride dosing	○	◎
Rapid mixing	○	○
Flocculation	○	○
Sedimentation	○	○
Rapid sand filtration	○	◎
Post-chlorination	◎	

◎: Critical control point

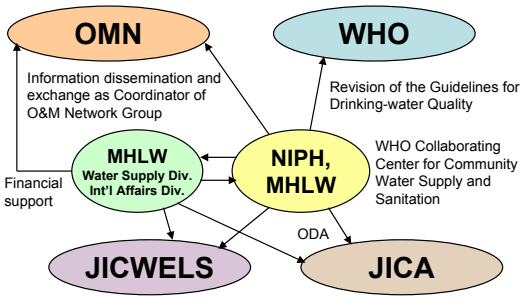
Note:
1) The number of critical control points may not exceed two for one hazard.
2) Priorities should be given to:
- chemical dosing,
- filtration, and
- those with frequent failures.

(Draft) Example of a Critical Control Point Sheet

From a Water Treatment Sheet

Item		Hazard		
		E. coli	*Crypto*	
Process		Post-chlorination	PAC dosing	Rapid sand filtration
Control parameter		Residual chlorine	Pump operation	Turbidity
Control limit		0.5-0.8mg/l	No disorder	<0.1unit
Calibration		Weekly	Monthly	Weekly
Monitoring/ Recording	Monitoring	○	○	○
	Alarming	○	○	×
	Recording	○	–	×
Factors of deviation and its preventive measures <Examples>		Insufficient dose → Dose increase	Pump failure → Inspection/ Maintenance	Fluctuation of raw water pH → pH adjustment
Remedial actions when the limit is exceeded	Treated water reservoir	Additional chlorination	Water transmission interruption and reservoir cleaning	
	Distribution reservoir	Additional chlorination	(Not applicable)	
	Consumer	Boiling	Boiling	

Those given a sign of "×" should be referred to in a Improvement Need Sheet.



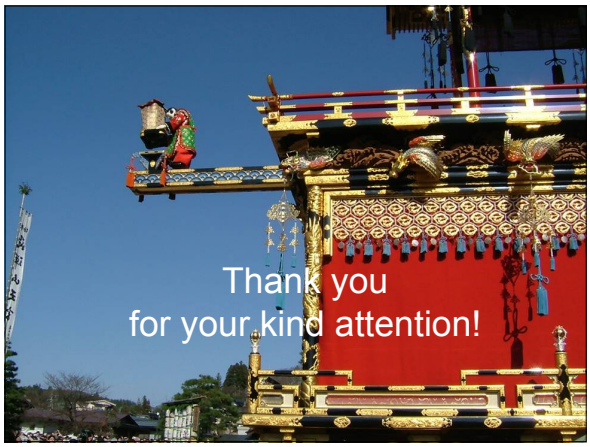
Japan's contribution to international cooperation in water supply sector

WSP dissemination to developing countries

- JICWELS Workshop on WSP and other topics, Hue, Vietnam, June 2005; Collaboration with OMN and WHO/WPRO
- JICWELS Seminar on Water Supply Management (WSP and other topics), Tokyo, January 2006; Collaboration with ONM, WHO/WPRO and NZ
- WHO-OMN Workshop for PPWSA on Water Supply Management (WSP and other topics), Phnom Penh, Cambodia, October 2006

Conclusions

- WSP is essential for ensuring drinking water safety.
- Hazard identification is a key of WSP.
- Catchment management should be paid more attention to by drinking water suppliers.
- The way of WSP application may vary according to the situations.


Thank you
for your kind attention!